REMARKS

Claims 1-27 and 29 are currently pending in the present application. The Examiner has withdrawn Claims 8-12 and 20-23 as being directed to a non-elected species. New Claim 32 is added herein. Applicants respectfully request reconsideration of this application in view of the following remarks.

Claims 1-7, 13-19, 24-27 and 29 stand rejected under 35 U.S.C. §112, first paragraph, as allegedly failing to comply with the enablement requirement. The Office Action contends that the disclosure as originally filed is directed to very limited types of modified surfaces and devices, very limited types of environments, very limited types of particles and very limited means of modifying a surface to achieve the recited matching of LW surface free energy. *Office Action*, pages 2-3. Additionally, the Office Action alleges that there is no methodology or technique provided as to the calculation of LW surface free energy of various particles and various surfaces with respect to various environments. *Office Action*, page 2. The Office Action also alleges that the disclosure as originally filed fails to enable one of ordinary skill in the art to adjust the LW surface free energy of various surfaces as to achieve the required match with the LW surface free energy of various particles. *Id.*

Applicants respectfully traverse this rejection for at least the reason that one of ordinary skill in the art at the time of the invention would have understood how to calculate the LW surface free energy of a particular surface and/or particular particles, and how to modify the LW surface free energy of the surface in order to render it equal to or approximately equal to the LW surface free energy of the particles. While the present specification describes exemplary surfaces, environments and particles, one of ordinary skill in the art at the time of the invention would have been aware of how to measure the LW surface free energy of other surfaces and particles, and one of ordinary skill in the art would have been able to used the described techniques, and other techniques known in the art, to modify the LW of other surfaces.

Methods of determining the LW surface free energy are known to those of ordinary skill in the art. For example, contact angle goniometry may be used to determine the LW surface free energies of the surfaces and the particles. In support of this assertion, Applicants provide three references describing such techniques: (1) Sharma, P.K., et al., Analysis of different approaches for evaluation of surface energy of microbial cells by contact angle goniometry, *Advances in Colloid and Interface Science*, 98 (2002) 341-463 ("Sharma"); (2) van Oss, C.J., et al., Acid-base interfacial interactions in aqueous media, *Colloids and Surfaces A; Physiochemical and Engineering Aspects*, Volume 78, 15 October 1993, 1-49 ("van Oss"); and (3) Zhao Q., et al., Effect of temperature on the surface free energy of amorphous carbon films, *Journal of Colloid and Interface Science*, 280 (2004); 174-183 ("Zhao"). These references describe several methods of contact angle measurement and analysis, including methods that were known and used at the time of the instant invention. Applicants describe an exemplary method for determining the LW free surface energy of a surface or particle below.

The theory of the contact angle of pure liquids on a solid was developed nearly 200 years ago in terms of the Young equation (eq. 1, see Sharma):

$$\gamma_L \cos\theta = \gamma_S - \gamma_{SL} \qquad (1)$$

wherein γ_L is the experimentally determined surface tension of the liquid, θ is the contact angle, γ_S is the surface free energy of the solid and γ_{SL} is the solid/liquid interfacial energy. In order to obtain the solid surface free energy γ_S, an estimate of γ_{SL} may be obtained. In 1962 Fowkes (see Sharma) pioneered a surface free energy component approach. He divided the total surface free energy in 2 parts: dispersive part and non-dispersive (or polar) part. The first part results from the molecular interaction due to London forces and the second part is due to all the non-London forces (see eq. 2):

$$\gamma_i = \gamma_i^d + \gamma_i^p \qquad (2)$$

van Oss (*see* van Oss) developed an acid-base approach for the calculation of surface free energy. The surface free energy is seen as the sum of a LW apolar component γ_i^{LW} (corresponding to γ_i^d) and a Lewis acid-base polar component γ_i^{AB} (corresponding to γ_i^p):

$$\gamma_i = \gamma_i^{LW} + \gamma_i^{AB} \tag{3}$$

The acid-base polar component γ_i^{AB} can be further subdivided by using specific terms for an electron donor (γ_i^-) and an electron acceptor (γ_i^+) subcomponent:

$$\gamma_i^{AB} = 2\sqrt{\gamma_i^+ \gamma_i^-} \tag{4}$$

The solid/liquid interfacial energy is then given by:

$$\gamma_{SL} = \gamma_S + \gamma_L - 2(\sqrt{\gamma_S^{LW} \cdot \gamma_L^{LW}} + \sqrt{\gamma_S^+ \cdot \gamma_L^-} + \sqrt{\gamma_S^- \cdot \gamma_L^+}) \tag{5}$$

Combining this with the Young equation (1), a relation between the measured contact angle and the solid and liquid surface free energy terms can be obtained:

$$\gamma_L \cdot (1 + \cos\theta) = 2(\sqrt{\gamma_S^{LW} \cdot \gamma_L^{LW}} + \sqrt{\gamma_S^+ \cdot \gamma_L^-} + \sqrt{\gamma_S^- \cdot \gamma_L^+}) \tag{6}$$

In order to determine the surface free energy components (γ_S^{LW}) and parameters γ_S^+ and γ_S^- of a solid, the contact angles of at least three liquids with known surface tension components (γ_L^{LW}, γ_L^+, γ_L^-), two of which must be polar, have to be determined. Equation 6 (see Zhao) is now widely accepted for the calculation the surface free energy components (γ_S^{LW}).

In addition to the known methods of measuring the LW free surface energies, Applicants also submit that one of ordinary skill in the art at the time of the invention would have been able to modify a surface to render it equal to or approximately equal to the LW free surface energy of particles in an environment surrounding the surface. As an example, Figure 1 of the present application illustrates how the surface energy of a diamond-like carbon coating may be varied from less than 25 mN/m to more than 45 mN/m based on the incorporation of other elements into the coating. Such a coating may be applied to a surface to modify it to be equal or approximately equal to the LW free surface energy of particles in an environment surrounding the surface. The specification also describes other coatings, such as Ag-PTFE-surfactant coatings and Ni-Cu-P-PTFE coatings, which may be applied to a surface to modify the LW free surface energy. Additionally, one of ordinary skill in the art at the time of the invention would have been aware of other coatings, and other methods of modifying surfaces, which may be used to modify a particular surface in order to produce a particular LW surface free energy. Furthermore, one of ordinary skill in the art could have used methods for determining the LW surface energy of a surface, such as contact angle goniometry, to perform routine experimentation on a surface to arrive at a modified surface that is equal or approximately equal to the LW free surface energy of particles in an environment surrounding the surface.

As such, for at least the foregoing reasons, Applicants submit that Claims 1-7, 13-19, 24-27 and 29 are enabled. Thus, Applicants respectfully request that the present rejection be withdrawn, that withdrawn Claims 8-12, 20-23 be rejoined and that a Notice of Allowance be issued in due course. The Examiner is invited and encouraged to contact the undersigned directly in order to expedite the prosecution of the pending claims to issue. In any event, any questions that the Examiner may have should be directed to the undersigned, who may be reached at (919) 854-1400.

Respectfully submitted,

Dolores W. Herman

Dolores W. Herman
Registration No. 51,800

Customer Number 20792
Myers Bigel Sibley & Sajovec, P.A.
P.O. Box 37428
Raleigh, NC 27627
919-854-1400
919-854-1401 (Fax)

CERTIFICATION OF ELECTRONIC TRANSMISSION UNDER 37 CFR § 1.8

I hereby certify that this correspondence is being transmitted via the Office electronic filing system in accordance with § 1.6(a)(4) to the U.S. Patent and Trademark Office on September 18, 2009

Betty-Lou Rosser
Date of Signature: September 18, 2009